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# INSTRUCTION

*Instructor Training Module #3*

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## Words/Terms

1. *Amenable* Able to be persuaded or capable of being judged
2. *Anticipate* Expect
3. *Application* Solving of a problem in a new situation using knowledge gained in instruction
4. *Appropriate* Proper or fitting
5. *Attitude* A feeling, emotion, posture and subsequent behavior toward a fact or situation
6. *Circumstances* Events or setting surrounding some action or activity
7. *Composite* Made up of separate parts
8. *Comprehension* Mastery or learning of specific facts and concepts
9. *Constitute* To make up or compose
10. *Criterion* Element or quality of performance to be judged, such as speed or accuracy
11. *Definitively* Explicitly, conclusively and thoroughly done
12. *Level of Success* Value or score of assessment, stated to separate acceptable from unacceptable performance
13. *Operations* Modes or courses of action
14. *Optimal* The best or most favorable
15. *Performance* An action or presentation in accord with some expectation
16. *Prerequisite* A requirement necessary for something else to follow
17. *Proscribe* To prohibit
18. *Standard* A rule that can be used to judge the value of a performance
19. *Systematizing* Grouping according to principles
20. *Type of Reasoning* The type of thinking in which the apprentice must engage to use the skill under consideration.

# 1. How To Use This Booklet

## What Is the Series About?

Related subjects instruction is an essential part of every apprenticeship program. It is the program component through which apprentices are taught the background theory and range of application of associated technical subjects such as mathematics, science and safety. Related instruction usually takes place in a classroom, after the regular workday is over. Most frequently, related instruction is taught by a skilled tradesperson or craftworker. For the tradesperson or craftworker to be an effective trainer, he or she must not only know their trade skill, but also they must use teaching skills appropriate for conveying that information to apprentices. This series of materials is written to train related subjects instructors in the critical teaching skills necessary to perform their jobs effectively. The titles of the booklets in the series are:

1. *Introduction to Related Subjects Instruction and Inservice Training Materials*
2. *Planning the Apprenticeship Program*
3. *Planning Related Subjects Instruction*
4. *Developing Instructional Materials for Apprentices*
5. *Presenting Information to Apprentices*
6. *Directing Learning Activities for Instruction*
7. *Providing for Individual Learner Needs*
8. *Controlling Instructional Settings*
9. *Evaluating Apprentice Performance*
10. *Communicating with Apprentices*

The first booklet introduces the series, describes the content of each booklet, and provides an overview of apprenticeship and of adult learners. The second booklet describes how to plan an apprenticeship program and may be used by vocational educators, related instructors, sponsors or service agencies. Each of the other eight booklets deals with a set of training skills

sions in preparation to teach. They include decisions about content to be taught, teaching techniques, topical emphasis within content, expected skill/knowledge acquisition, resource use, topic sequence, type of material and the type of presentation. This booklet will plan instruction effectively and efficiently so that you perform confidently a variety of tasks, most critical of which are described in

1. Identify specific knowledges, skills and attitudes for inclusion in related subjects instruction;
2. Develop and specify performance objectives for related subjects;
3. Determine standards of performance;
4. Provide for appropriate use and value of instructional time, activities and materials.

## What Must I Do To Complete My Work In This Booklet?

Working your way through this booklet will require you to read the text, to answer the questions, to perform the exercises, and to complete the assessment instruments. Expect to spend about four hours working through the materials. The resources you need to complete your work in this booklet are (1) a copy of the booklet; (2) a quiet place to sit; (3) about three-to-four hours of time; and (4) a record of past related instruction experience.

The materials are written in a self-instructional format. You may work through the materials at your own pace. You may work on examples and questions at your own pace. You may need not complete your work in this booklet in one sitting.

Each chapter in the booklet is designed to

should include, in order, the following things:

- Complete the self-assessment;
- Read and consider in detail the introduction and objectives for each skill;
- Read and study the text, examples and illustrations provided for each skill;
- Complete the self-test exercise for each chapter and compare your answers with those provided in the appendix;
- If you complete the exercise as directed, continue your work in the booklet; if you fail to answer the questions correctly, repeat your work in the chapter under consideration; and
- At the conclusion of the booklet, complete the posttest for the unit. Check your answers against

## How Much Do I Know About Subject Before I Begin?

The self-assessment will assist you to identify competency areas associated with planning. Read each competency statement listed and assess your level of knowledge about a skill in performing that task. Knowledge you know about the subject while your experience in successfully performing the number that best describes your level and skill. Competencies where your rating is fair are those that you should concentrate particular attention to the chapters which address those competencies.



CHAPTERS	COMPETENCIES		RATING		
			Poor	Fair	Good
2. Skill: Identify Specific Knowledges, Skills and Attitudes for Inclusion in Related Subjects Instruction	1. Identify work activities and tasks	Knowledge Skill	1 1	2 2	3 3
	2. Determine skills, knowledges and attitudes necessary for performing work activities	Knowledge Skill	1 1	2 2	3 3
	3. Group skills, knowledges and attitudes into topics and subjects as content	Knowledge Skill	1 1	2 2	3 3
3. Skill: Develop and Specify Performance Objectives	4. Construct performance objectives	Knowledge Skill	1 1	2 2	3 3
	5. Determine and utilize several different levels of reasoning/thinking/operation among learners	Knowledge Skill	1 1	2 2	3 3
	6. Specify conditions of performance	Knowledge Skill	1 1	2 2	3 3
4. Skill: Determine Standards of Performance	7. Specify standards of performance including criteria and levels of success	Knowledge Skill	1 1	2 2	3 3
5. Skill: Provide for Appropriate Use and Variety of Instructional Time, Activities and Materials	8. Identify factors/decisions to make when planning instruction	Knowledge Skill	1 1	2 2	3 3
	9. Sequence materials	Knowledge Skill	1 1	2 2	3 3
	10. Develop a Plan for Instruction	Knowledge Skill	1 1	2 2	3 3

## 2. Skill: Identify Specific Knowledges, Skills and Attitudes for Inclusion in Related Subjects Instruction

### Introduction and Objectives

The primary task of planning instruction is deciding what to teach. For you as a related subjects instructor, this process involves three operations: (1) identifying the knowledges, skills and attitudes necessary for successful job performance; (2) deciding on the appropriateness of the information for inclusion in related instruction; and (3) fitting the information into a content framework for the related subjects instructional experience. To perform these tasks effectively, you must use the competencies explained in this chapter. When you have completed your work in this booklet, you will demonstrate your capabilities by being able to:

1. Identify the aspects of the job analysis process;
2. Critique a job analysis to identify necessary skills, knowledges and attitudes;
3. Suggest ways of grouping and relating identified necessary skills, knowledges and attitudes; and
4. Outline a procedure to identify specific knowledges, skills and attitudes for your own related subjects instructional responsibilities.

As you begin to work through this unit of materials, reflect on the ways you have identified necessary skills and knowledges in related instruction in the past. Consider how the ideas suggested in these materials could be incorporated into current practice.

### What, Why and When To Identify Skills, Knowledges and Attitudes

The underlying purpose of related subjects instruction is to provide apprentices with important work-related information that is not taught on-the-job. Such

information includes mathematics, blueprint reading and interpersonal communications. Sometimes they even may suggest an optimal number of hours of contact time within each related subject area. It is your responsibility to determine the topics within the broad subject areas and to ensure that the topics coincide with the necessary knowledges, skills and attitudes for working on the job. This means that you must be familiar with the requirements of the job, the potential topics within subject areas, and the procedures for identifying and grouping skills and knowledges into instructional areas. This is particularly important and difficult for related subjects instruction because, unlike traditional education, you must be concerned not only with background knowledge, but also with the application of knowledge in the form of skills. Further, all information must relate directly to a specific craft or trade.

You must identify necessary knowledges, skills and attitudes for content before beginning the related subjects instructional process. You must decide on the exact training content, the requirements for instructional materials, the expected outcomes to include in performance objectives, and a suggested order of emphasis for teaching the materials. Not only must you identify specific knowledges, skills and attitudes before beginning training, you also must consider these issues periodically throughout the instructional period in order to determine if your training efforts are effective. Such assessments during the instructional term usually occur in conjunction with evaluating apprentice learning and performance.

### How To Identify Specific Knowledges, Skills and Attitudes for Each Performance Objective

work activities from your own experience, by working with journeymen in the craft or trade, by observing journeymen at work, by talking with the program sponsor and by talking with apprentices. Develop a list of work activities, usually as a description of tasks performed on the job. In addition, you should note those activities that are performed most frequently, those that are considered most important and those that are prerequisite tasks for later activities. Note this information in the chart following the listing of activities.

#### Step 4: Note Equipment Use

Identify equipment used on the job, noting what is used, when it is used, how it is used and to what purpose. Add this information to the data about work activities.

Figure 2: JOB ANALYSIS

[illegible]

## Step 5: Assess Quality Standards

Identify required, acceptable work performance or outcomes for each listed work activity. Focus your thinking on such items as the ways of measuring amount and quality of work performed. Formal on-the-job work evaluation techniques also should be included in this step. Add these notes to your listing of work activities.

## Step 6: Identify Job Context

Note any job context circumstances that are critical to successful work performance. Items to consider include work schedules, working conditions, work incentives and the organization and social situation of the work place. Add this information as a separate topic to the list of activities *unless* the particular information influences job performance directly; in such cases, enter the information with the job activity.

## Step 7: List Safety Considerations

List any important safety considerations for each activity. Attend especially to equipment use in completing this column. Check your specific legal obligations as you think through each activity.

## Step 8: Group Information

Examine the job analysis list of activities and think specifically about what a worker must know in order to perform successfully the activities you have listed. Use the following checklist as a way of considering the types of knowledges an apprentice must possess to perform one of the activities you might have listed.

1. Scientific principles
2. Mathematical operations and formulas
3. Necessary safety precautions
4. Safety procedures in case of accident
5. Tool identification
6. Tool use procedures
7. Measurement terms
8. Measurement operations
9. Measurement quantities
10. Communication skills (oral, written, graphic)
11. Reading requirements (types and level of difficulty)

that you can cover in your related subjects effort.

In performing this step you will find it efficient to enter each activity you listed on your job analysis sheet at a time, and work through the list or condensed list of types of skills and knowledges. Many instructors enter each activity on a note card or piece of paper and proceed to record under the activity name all the topics within each of the suggested types of skills and knowledges appropriate to that activity. For example, for an activity such as mitering a cabinet corner there might be listed, at a minimum, topics such as identification and use of a measuring tape; identification and use of a square and T-square; selection of lumber; identification and use of miter box; measurement in inches, centimeters and millimeters; safety precautions and types of joints to be made.

## Step 9: Decide on Content

Review the list of activities and the topics associated with each listed activity. Group identical and similar topics from throughout the entire listing of activities and place the composite topics under similar headings. For example, you might find references to solving for unknowns, algebra, equations and compound fractions spread across your lists. These items might be combined into a single heading of solving compound fractions. Further, this topic could have been grouped under a heading entitled basic mathematics. Other subject headings in addition to basic mathematics frequently found in related subjects instruction may be sketching, drawing and blueprint reading; measurement; tools; safety; law and labor relations; working in organizations, industry; personal skills and communications; general physical science; property of matter and materials; occupational procedures; job reading and writing literacy; job selection, obtaining and retraining skills; management and supervision; economics and introduction to apprenticeship. Refer to this list to help you complete your job analysis. Save the activities list you developed; you will use it as examples of knowledge application.

After compiling and grouping the assorted topics you must examine the list in order to decide, for each listed item, if the content is more appropriately taught in related subjects instruction or on-the-job. In making this decision, consider if the subject matter is more

were trained in the kitchen of the flagship hotel franchise in other hotels in the chain. Ruiz, one of three chefs in the kitchen, also was the related subjects instructor in the employer-sponsored apprenticeship program for chefs operated by the hotel chain. He was responsible for

Figure 3: DISPLAY OF PROPOSED CONTENT FOR STEP #9: DECIDE ON CONTENT

Job Activities		Related Subjects Instruction				
Activities/Skills in Chronological Order	Equipment Required for Skills to be Taught	Math Required	Science Required	Other Information Safety Blueprint Reading	Auxiliary Information	Reference Needed Instructional Materials
1. Selection of materials to be cut	Combination square, back-saw, miter box, wood clamp, etc.	Measurements in conventional system and metric system  Whole numbers and fractions	Determination of wood grain and point to start the cut	Reading comprehension  Safety instruction  Splintering  Reading a blueprint	Wood types  How to "cope" a molding  Types of moldings	Handbook magazine articles, f etc.
2. Layout and marking miter						
3. Cutting the miter						
4. (etc.)						

related subjects content other than his own considerable experience and the general hotel policy on meal preparation which was summarized as a commitment to fresh, first-quality ingredients; house specialties that rotated on a two week schedule, and an expected ratio of food cost to menu price of .7 to 1.0.

In order to determine what to teach in related subjects instruction, Ruiz followed the several steps presented in this booklet. He examined his own experience and activities as well as that of the other chef supervisors and the several journeyworker chefs in order to develop a list of activities and tasks performed

activity. Next, using the checklist of typical knowledges presented in Step 7 and the group techniques suggested in Step 8, Ruiz developed a preliminary list of subjects and topics to cover. Finally, using the information he developed a chart of content similar to that suggested in Figure 3 for first- and second-year apprentices. Using the chart in Figure 4, Ruiz organized the content and tailored it to the work situation of the apprentice chef. Finally, he adjusted the content emphasis so that it accurately reflected the importance of various activities as well as the chronological order in which activities are performed on the job.

Figure 4: TABLE OF CONTENT SPECIFICATIONS

ACTIVITIES (Years 1-2)	I m p o r t a n c e 1-2-3	CONTENT SUBJECT AREAS														
		Safety			Measurement					Basic Science			Interpersonal Skills			
		Protection Devices	Responsibility	Tools	Clothing & Hygiene	Quantity	Tools	Tables	Weights/Volumes	Energy	Materials	Liquids Gases		Working Under Super.	Directions	Job Literacy
1. Clean work area	2	X	X	X										X	X	
2. Clean mixer, slicer, grill, oven, etc.	1			X	X									X	X	
3. Set out tools for meal	3			X	X		X	X						X	X	
4. Stock supplies	3		X			X			X		X			X	X	
5. Serve portions	3				X	X	X	X	X					X	X	
6. Operate machinery	1	X	X	X	X			X		X	X	X		X	X	
7. Read, listed, recite recipes	1					X		X	X		X	X		X	X	X

1. List the steps in the suggested job analysis procedure.

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_
- e. \_\_\_\_\_
- f. \_\_\_\_\_
- g. \_\_\_\_\_
- h. \_\_\_\_\_
- i. \_\_\_\_\_

2. Read the following list of knowledges and information. Group similar items together and suggest a general category name for each grouping. While space is provided for up to six categories you are welcome to use more or fewer categories.

- |                                 |                               |
|---------------------------------|-------------------------------|
| a. determine weights            | h. apprenticeable occupations |
| b. constructive criticism       | i. protective devices         |
| c. toxic substances             | j. pride in work              |
| d. provisions of apprenticeship | k. fractions                  |
| e. noise                        | l. working under supervision  |
| f. whole numbers                | m. use of tables              |
| g. time cards/pay checks        | n. determine angles           |

- |          |          |          |
|----------|----------|----------|
| 1. _____ | 2. _____ | 3. _____ |
| 4. _____ | 5. _____ | 6. _____ |

3. Consider your own related subjects instructional responsibilities. Outline a procedure for determining what to teach.

## Introduction and Objectives

Perhaps the most critical tasks in planning for instruction are deciding and explaining exactly what you must teach. These tasks are critical because in apprenticeship your goal is to help *each* apprentice eventually acquire necessary knowledge and skills for his or her selected craft or trade. That requires that both you and the apprentice learn and characteristics of the trade or craft, its methods and outcomes. This is particularly important in apprenticeship because learning involves doing, watching, discussing, reading and using any other means available to acquire and apply information. Trainees are expected to learn and to succeed.

The exact time span for learning any particular aspect of an occupation varies according to how quickly the learner learns and characteristics of the trade or craft. Instruction often is organized around individual differences and limitations and may use a variety of means to convey information. Individual records on learning and on time spent in instruction are maintained for each apprentice. Outcomes of instruction are emphasized and are expressed as objectives. Objectives indicate expected learning in performance terms. They explain exactly how the apprentice must behave or perform, how well she or he must perform, and under what conditions the performance must take place. Objectives are shared with apprentices and become the instructional goals for the class.

Writing objectives requires you to combine several competencies and types of information. It is a time-consuming process in planning instruction, but pays dividends in terms of overall organization and weekly preparation for your related subjects instructional activities. When you have completed your work in this unit on materials, you will demonstrate your competency in this skill by being able to:

1. Construct and critique specific instructional behavioral performance objectives using two different types of reasoning;
2. Identify the parts of a performance objective; and
3. Specify the elements or conditions of performance.

## What Are and Why Specify Performance Objectives

Performance objectives are the behavioral goals you establish for the apprentices in your charge. Objectives declare instructional intent by describing what the learner will be able to do after instruction that he or she could not do before instruction. They provide clear direction and focus for the learner and for you.

Objectives can be stated at several organizational levels, each of which has specific purposes. For example, objectives may be established at the State level by the State Joint Apprenticeship Committee as goals of policy; objectives may be local objectives established by the local JAC or the local education agency participating in the program and function as guidelines or directions; or objectives may be class-specific, established by you as an instructor and developed to direct and to focus related subjects training activities. At the class level—and particularly when used at the training level—observe the following principles of objective writing as you develop objectives.

1. Objectives should be *worthwhile and significant*. They should emphasize the most important content points and ignore trivial information.
2. Objectives should be *achievable*. They should not be set either artificially high or artificially low.
3. Objectives should be *measurable*. They should suggest appropriate evaluation strategies and techniques. Further, objectives should indicate desired changes in learner performance that result from the instruction.
4. Objectives should be *precise*. They should be specific enough to serve as guides for selecting instructional strategies and materials.
5. Objectives should be *shared*. They should be conveyed to everyone involved in the instructional task.

## How To Write Performance Objectives



ments. The important components of objectives

**Who** must perform the desired behavior. The person or group of persons—apprentice or percentage of the class—is noted.

**What** behavior must be performed in demonstrating mastery. The task, behavior or performance is described in verb form.

**To What Result.** The outcome of the application of knowledge or skill must be specified in procedure and product form.

**How Well.** The standard to which the apprentice must perform in order to be judged successful must be stated. This standard can be specified as speed, errors, quality, percent of answers correct or by a variety of other criteria.

**Under What Conditions.** The conditions under which the performance must occur must be specified, noting any factors that may encourage or interfere with performance.

Below is a sample structure for writing an instructional behavioral objective. Note that each part of the objective has been labeled.

the circumstances such as time and materials which the specific performance must take place. In any way, content and apprentice behavior is included in objectives.

Use the following steps to simplify the process of writing your performance objectives.

### *Step 1: Review Content and Outcomes*

Review course content and proposed learning outcomes to determine the content of the performance objective. Consider again the inputs to the process such as industry guidelines, the task/activity analysis, subject crafts or trades, sponsor demands and your own experience as a craftworker. Usually you will need to develop at least one performance objective for each major content and each major expected outcome within related subjects instruction.

### *Step 2: Note Who*

Decide exactly who will perform the desired behavioral outcome. Will individual apprentices demonstrate the skill or knowledge or will apprentices be grouped by trade/craft, by year, or the entire group demonstrate the learning task. Make this decision

Figure 5: SAMPLE INSTRUCTIONAL BEHAVIORAL OBJECTIVES

h plumbing apprentice

b)

l solve

u)

t of math problems about the necessary fall in drainage lines

what result)

ieving a score of 90% within 1 centimeter tolerance on

v well)

uper and pencil test of written problems using blueprints within the

equipment each apprentice performance associated with learning must occur. The important consideration is that you must decide about these factors before beginning so that the performance conditions are standard for all apprentices. Further, advance planning permits you to handle or anticipate many of the problems that arise during instruction or testing. The specific factors or conditions you must consider and control are:

- time of performance;
- time allowed for completion of task;
- temperature, light, ventilation;
- resources needed such as materials, supplies and equipment; and
- level of difficulty of operation to be performed.

Consider each of these factors both at the time of objective development and when preparing the directions for the test.

### 7: Write Full Objective

Combine the parts of each objective in written form using the structure in Figure 5.

### Example

Julia Margolas was a related subjects instructor in an apprenticeship and training program for printers. The program was located in a large midwestern city and sponsored by the local JATC representing the union and employers. Margolas, a union member and six-year journeyman was assigned as an instructor in the first of related studies. Topics to be covered included technical English, law and labor relations, safety, basic materials and basic measurement.

She set about the task of generating performance objectives for each topic of content. For example, in the area of law and labor relations she was to cover the various roles of unions, common worker benefits and collective bargaining. Margolas listed each of these

she listed unemployment insurance, workman's compensation and wage and hour considerations. She then proceeded to work through the steps outlined in this module to develop performance objectives. She reviewed the content, decided who would perform, decided upon the level and type of operation involved in performance, determined the standards for successful performance and articulated the conditions for performance. She formalized this information by developing a performance objective for each major information point within each topic of instruction. Several of the objectives read as follows:

1. Each apprentice will demonstrate the appropriate procedure for filing for worker's compensation for work-related accidents in a simulated in-class setting with no more than one mistake in the seven prescribed operations.
2. Each apprentice will recall the responsibilities of the Wage and Hour Commission on a matching test by correctly identifying all of the issues that the Commission oversees.
3. Each apprentice will list in a written form in ten minutes and without error the procedure for filing a claim through the State Employment Office.

With these objectives Margolas could plan instruction, explain what was expected of the apprentices and develop her evaluation instruments.

### Additional Information

You may find that reading sources like the following will help you prepare effective performance objectives:

R.F. Mager. *Measuring Instructional Intent* (Belmont, California: Fearon Pitman Publishers, Inc.; 1973).

R.F. Mager. *Preparing Instructional Objectives* (Belmont, California: Fearon Pitman Publishers, Inc.; 1962).

In the following objective, underline the series of words that constitute the criterion level.

Given ten historical incidents about labor relations, on a paper and pencil test, each apprentice will correctly match 9 of the 10 incidents with the title of the labor legislation the incident affected.

What do the *conditions* of the behavioral objective specify?

\_\_\_\_\_

\_\_\_\_\_

Indicate in the space to the left the type of reasoning expressed in each of the following phrases.

- \_\_\_\_\_ A. Given bathroom specifications, the apprentice will calculate the amount and cost of tile needed to cover the prescribed surface . . .
- \_\_\_\_\_ B. The apprentice will employ 4 of 5 supervisor suggestions . . .
- \_\_\_\_\_ C. Given a need to drill a hole, the apprentice will select and use the appropriate tool and . . .
- \_\_\_\_\_ D. The apprentice will list the major historical advantages of union membership . . .
- \_\_\_\_\_ E. The apprentice will distinguish among the types of drawings on the blueprint and use the orthographic views . . .

## Introduction and Objectives

A standard is a rule, operation or product through which a judgment can be made about apprentice performance. A standard consists of two parts: (1) the criterion or element of performance to be examined and (2) the level of success of performance for that single element or criterion.

A standard can be set for any or all of the tasks or activities of a trade or craft. It is fundamental to the instructional process because it sets forth definitively the terms that separate successful and unsuccessful performance by an apprentice. As an instructor, you must determine both the elements of performance and the level of success that will separate successful from unsuccessful performance. Often industry standards will help you in this task.

As you work through the following materials, you will consider how to make decisions about performance standards that permit you to distinguish successful and unsuccessful performances. When you have completed your work in this unit of materials you will demonstrate your competence in this skill by being able

1. Distinguish and define the various types of criteria that may be applicable to related instruction.
2. Analyze a related studies situation and suggest appropriate types and levels of criteria that might be useful to assess performance.
3. Indicate where information about such criteria may be found.

As you work, recall your prior related subjects experience, both as an instructor and an apprentice. What uses of standards were established as minimum requirements for demonstrating successful mastery of necessary knowledge and skills?

## Why Establish Performance Standards?

Suppose that one intended outcome of your instructional ability to calculate surface areas of forms found in

to learn and to demonstrate their skills and knowledge.

Your first considerations after deciding specific content are to decide (a) precisely what facts or elements of knowledge and skills are required and (b) what constitutes successful performance of the knowledge and skills. Would successful performance, for example, mean that an apprentice will calculate correctly the exact area of any geometric form you might present to the apprentice? Perhaps successful performance would mean that a trainee would solve correctly 90 percent of a set of problems on area drawn from a typical set of blueprints. Whatever you select as an indicator of successful performance, you must establish a level of success or benchmark that is the minimum successful performance and against which each apprentice performance can be compared in order to determine its value. Likewise you must determine the criterion or characteristics of performance on which to judge levels of success. Criteria or elements of performance mean things like speed and accuracy. The questions you must answer are for example: should speed and accuracy on use of equipment be a critical factor in distinguishing successful from unsuccessful performances?

Standards serve as reference points for judging performance of apprentices. They consist of two parts: a *criterion* and a minimum *level* of success. By comparing the apprentice's performance to the standards, you and related subjects instructor can determine precisely *what* skills and knowledges each apprentice has mastered as well as *how well* the skills and knowledges have been learned. The *what* is a description of the knowledge and skills possessed and exhibited by each apprentice in terms of behavior and performance elements; the *how well* is a description of the relative success of the performance as compared to some absolute. Both pieces of information are essential in the overall instructional evaluation process.

Establishing standards for assessment of apprentice skills and knowledges is important for several reasons. First, using standards gives meaning to your instructional planning and evaluation activities. Standards

## How To Establish Standards for Performance

The steps for establishing standards to use in determining the learning of skills and knowledge by apprentices are discussed below.

### *Step 1: Review Outcomes and Content*

Review course content and intended performance outcomes for the content. Consider the work of a journeyworker in the trade or occupation and determine *when* and *how* the course outcomes and content are used in daily work activities. As you consider content and outcomes, decide how important each content and outcome is compared to the others. Rank each in order of importance to the others. Then decide how you can tell if a new journeyworker possesses those skills or knowledges as you watch him or her work. Consider measures such as procedures, speed, accuracy and so forth.

### *Step 2: Identify Instances of Competence for Elements*

List all the ways you can tell when a journeyman or apprentice has the knowledge or skill in question related to each of the performance outcomes or content areas. These are criteria for performance.

### *Step 3: Not How Well Something Must Be Done to be Called Successful*

Examine each of the ways you can tell if someone has a knowledge or skill listed for each suggested outcome or content. How well does each of the ways listed have to be performed? What is the standard for performance? Are there tolerance or time or accuracy limits to the knowledge or skill? If so, list them on the same line with each outcome and observation. These are the level of success for each performance.

### *Step 4: Adapt Criteria to Related Subjects Setting*

Now consider your related subjects setting. Which of the criteria can be adapted to that setting? Are the criterion levels for success appropriate to the context?

Remember, standards are established before instruction begins as a part of the instructional planning process. They become part of the overall performance objectives and Plan for Instruction. They must be explained to apprentices at the beginning of the instruction and should be referred to before and after each test. Each apprentice's performance is compared to the standard rather than to the performance of another apprentice. Further, apprentice performances are either right or wrong since the standards are absolute.

Standards may be stated in a variety of ways depending upon the skills and knowledges to be learned. Usually the half of the standard called criteria are qualities of the skill being learned. Qualities of skills that you might consider in writing standards are:

- percent of items correct;
- degree of product quality;
- degree of appropriateness of procedures;
- speed of performance;
- adherence to directions;
- economy of effort;
- work standards such as adherence to specifications;
- accuracy; and
- use of equipment, materials, techniques, and so forth.

The "level for success" part of the standard must not be either too high or too low. You must make the level of success realistic in terms of the knowledge and skill necessary to perform competently on the job or task. Further, remember, you can adjust the level over time, as needed, based upon experience and changes in work requirements.

Usually there is useful information available to you as you develop the criteria and level of success of standards. For example, some industries have national guidelines that suggest minimum content knowledges and sometimes the criteria or qualities of performance.

Most local JATC's will assist you in setting forth a listing of skills and knowledges that must be learned together with suggested criteria and indicators of success. In many instances, your practical experience as a tradesperson will suggest appropriate skill and knowledge levels necessary to work effectively on the

direct on a test or something else more clearly classroom related. Ultimately, you should have two criteria and a level for success for each, for each performance outcome or content for your course.

### Step 6: Incorporate Data Performance Objective

Add the criteria and level for success to each performance objective. Construct your evaluation instruments and scoring procedures according to the information.

### Example

Lawrence Krenski was a tradesperson hired by the local JATC and the local community college to provide 44 hours of related subjects instruction to machinist apprentices. As a journeyworker and in cooperation with the local JATC, he determined the desired outcomes that were to result from participation in related instruction. Using the national guidelines, an outline of former related subjects courses and his own trade experience, Krenski identified the course content and divided it into instructional units. He listed the outcomes and contents of a machinist related subjects course in priority order. As he thought about his work as a journeyman and the work of people under his supervision, he confirmed his priority order for the content in this section. Further, he identified the qualities of the skills and knowledges in the content unit that he believed demonstrated whether a journeyman possessed the skill or knowledge in question. Krenski listed these items on a page as illustrated in Figure 6. Recall that the ways to determine if a journeyman has skills and knowledges are called criteria or qualities of the skill.

Next Krenski considered each skill or knowledge and its criterion in order to determine the degree of permissible tolerance in a successful performance. For example, for recognition of the appropriate scale to use, Krenski knew that a beginning journeyworker had to be correct 100 percent of the time; however, beginning

had to be correct 95 percent of the time where a journeyman had to be correct 100 percent of the time. Krenski entered these values on the appropriate line in the figure that contained the contents and criteria. These figures are called the minimum levels of success for each criterion.

After considering the minimum level of success for apprentices and journeymen for each suggested criterion, Krenski considered how each criterion level of success could be applied in a related subject classroom. For example, he decided that for testing selection and use of the appropriate caliper, he would provide each apprentice with a set of work situations and require the apprentice to select and use the appropriate caliper and record the answer. The apprentice would be graded on the appropriateness of selection on the speed of response and on the accuracy of the answer provided. Further, based upon his consideration of the work setting, Krenski decided that to perform successfully, each beginning apprentice would have to select the proper instrument nine out of ten times and would have to answer all thirty problems in 15 minutes. Further, to be counted as correct an answer would have to be within  $\pm 1$  mm of Krenski's suggested answer.

Having made these decisions, Krenski entered the information in his performance objectives and constructed his tests. He had determined the criteria of performance for this portion of course content.

### Additional Information

You may find that reading sources like the following will help you develop appropriate standards for performance.

W.P. Gerth, R.P. O'Reilly and P.D. Pinski. *Comprehensive Achievement Monitoring* (Englewood Cliffs, Educational Technology Publications, 1975)  
R.F. Mager. *Measuring Instruction Intent* (Belmont, California; Fearon Pitman Publications, Inc.)

## **I. MEASURING DEVICES**

**A. Scales—functional and decimal**

**Accuracy**

**B. Calipers**

**Appropriateness, Speed, Procedures, Accuracy**

**1. Regular Micrometer  
(inside and outside)**

**Appropriateness, Speed, Procedures, Accuracy**

**2. Vernier Micrometer  
(inside and outside)**

**C. Dial indicators**

**Speed, Procedures, Accuracy**

**D. Optical comparators**

**Appropriateness, Accuracy**

**E. Flats**

**Appropriateness, Accuracy**

**F. Angle and taper measuring**

**Accuracy, Use of Equipment, Speed**

**G. Gages and gage blocks**

**Appropriateness**

## **II. MEASURING SYSTEMS**

**A. Linear measure**

**Accuracy (% correct)**

**B. Area measure**

**Accuracy (% correct)**

**C. Volume measure**

**Accuracy (% correct)**

**D. Weight measure**

**Accuracy (% correct)**

**E. Gages/pressure measure**

**Accuracy (% correct)**

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Check each item that is a type of criterion that might be used in a related subjects course.

- ( a ) accuracy
- ( b ) speed of performance
- ( c ) percent of items correct
- ( d ) use of equipment
- ( e ) degree of appropriateness
- ( f ) degree of quality
- ( g ) economy of effort

2. Check the letter of the item that is the best completion for the following statement.

The best source of information for establishing realistic criteria for success is:

- ( a ) journeyworker activities on-the-job
- ( b ) information from others (and former) related subjects instructors
- ( c ) your experience as a former apprentice and journeyman
- ( d ) curriculum and content outlines for instructional materials

3. Consider the materials on safety in your trade and your related subjects course. Using the format below, list topics of concern and for each topic suggest at least one criterion that could be used to determine if an apprentice possesses the knowledge or skill. Next, consider each listed criterion and suggest what you consider to be a reasonable level of success that demonstrates mastery of the topic. Check your answers against the steps in this unit and against the suggestions offered in the back of this booklet.

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#### SAFETY

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Topic	Criterion	Level of Success
1.		
2.		
3.		

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4. Based upon the information in the following situation, suggest the ideas that might be used to establish acceptable standards.

Pat Hendrick, a journeyworker machinist in automotive manufacturing with eight years of experience at a national manufacturer, recently has accepted a position as a related studies instructor in a machinist training program taught in conjunction with a local JATC and the area community college. The course has been offered for several years and uses instructional materials supplied by the international union. Pat, a former apprentice, currently works full time in a shop with five other journeymen and several apprentices. Her problem is that she is concerned about setting appropriate levels for successful performance. To what sources might she refer in her attempts to set class standards?



## Introduction and Objectives

Once you have identified necessary content and expected learning outcomes and have written the performance objectives, turn your attention to *when* and *how* the content will be offered in the related subjects experience. The "when" and "how" of providing content is a necessary related instructional task regardless of whether the experience is offered as a class or as an individual activity. You must make decisions about the amount of time allocated to each topic for the average apprentice, the general sequence of instructional activity, types of instructional materials needed, the general types of learning activities and the timing of evaluation activities.

Such information is compiled in a document called a Plan for Instruction (PFI) to which you can refer throughout the related subjects experience. The PFI is a composite of a curriculum guide and a unit plan, but not as detailed as a daily lesson plan. Daily planning is a skill explained in another instructor learning module.\* Construction of the PFI requires you to use a set of competencies associated with planning instruction that you should have acquired by the time you complete your work in this chapter. You will demonstrate your competence by being able to:

1. Suggest and discuss the factors that must be included in a Plan for Instruction; and
2. Develop a PFI for your own related subjects responsibilities.

## How to Construct a Plan for Instruction

The degree of formality of your PFI is entirely up to you. However, there are a series of decisions you must make that will result in *what* content is covered *when* in related subjects instruction. Consider and use the following steps in making those planning decisions and developing the PFI. The majority of steps are related to decisions you must make; some steps can be eliminated if your program has a policy that eliminates the necessity of your making the decision.

### Step 2: Enter Content and Objectives

Fill in the content and the performance objective sections for the various topics of related subjects instruction. List the content and objectives in order of importance. This information is the product of one, two and three of this module.

### Step 3: Enter Time-Length

Determine or review from your job analysis the importance of various content and topics. The relative importance of each content and its performance objective should be assigned a number and translated into amount of time to be spent on the subject. More complex subjects require and deserve more time. List the number of hours in a year of related subjects instruction—at least 144 as a minimum—and determine the number of hours of content time per apprentice for the various subjects within that 144-hour total. In other words, the total number of hours at the bottom of each column entitled "Degree of Emphasis in Time" should equal the number of hours in a year's work of related subjects instruction. The relative importance of content areas should have been determined during earlier job analysis.

### Step 4: Determine Sequence

Determine the sequence of content presentation. There are several techniques for determining the sequence of information presentation. For example, you might simply refer to the job analysis you completed earlier and provide instruction in conjunction with the chronological order of job activities and tasks. A second way to determine sequence is to gear material to the tasks each apprentice (or the majority of apprentices) is currently performing on the job. To do this, you must communicate frequently with apprentices and their supervisors. A third way to determine content sequence is by level of difficulty of material and prerequisite information. When using this particular technique, the easier material and the prerequisite material are introduced before the difficult material within each subject area. A fourth way to sequence content is

Content	Performance Objectives	Degree Of Emphasis (In Time)	Sequence Materials	Activities	Time For Evaluation

#### *Step 5: List Expected Instructional Activities*

The next section of your Plan For Instruction has been titled Activities. In this section, for each performance objective and content study, make general notes about four things. First, include items about how you plan to introduce and present the materials. For example, if you expect to use a demonstration in conjunction with reading a chapter of textbook and viewing a film, make notes to that effect. Do not go into detail about how you might deal with each instructional period on a topic. Just list your general intentions about how you will teach the subject matter.

Second, note expected apprentice learner activities. Such activities might include reading, on-the-job observation assignments, handouts, use of models and so forth.

Third, note any equipment needs you will have during this period of instruction. If you will need a slide projector, a model or a tool, indicate your need on

Again, make very brief notes and do it for entire topics, not for single class periods. Remember that the PFI provides an overview or a general picture of the entire related subjects program instructional content which you are responsible. Refer to it throughout the entire related subjects instructional period as you prepare to teach each day. It will help you to keep in perspective the overall thrust of the course regardless of the type of program you operate.

#### *Step 6: Suggest Times for Evaluation*

As you consider the overall related subjects instructional program, you will find it useful to record for reference the approximate times during which you will evaluate apprentice learning. For example, some topics may require testing on that topic alone immediately after you have completed the instruction; others may be better handled when combined with other topics and assessed every month or two. Again, brief notes will suffice. They are for your later reference and future effort.

problem, a fellow instructor in an apprenticeship program for air conditioning and refrigeration repair suggested this module of training material to Smith. As he read, he used his class as an example and performed each skill, one step at a time. As he began to construct his Plan For Instruction, it all fell into place in his mind. This was the tool he would use to reduce the fragmenta-

for the PFI, realizing that once he had this tool, it was acceptable for each apprentice to be doing some thing different. In the end, he would still be able to verify that each learner had completed all the work expected during this entire year of related subjects instruction. The PFI would simply match the apprentices' on-the-job activities to related content and ensure that an appropriate

Figure 8: PFI EXCERPT: MICHAEL SMITH

Content	Performance Objectives	Degree of Emphasis (Average Time Length)	Sequence of Materials	Activities	Time for Evaluation Mastery	Type of Evaluation
<b>Safety</b>						
Shock Prevention "Hot Chassis" Ground Fault	Each apprentice will answer correctly 18 of 20 written questions.			Presentation and film		
Grounding	Each apprentice will correctly discuss each of 20 grounding situations.	20 hours	As listed in content	Demonstration, pictures and presentation	Each class period	Knowledge-identification test
Double Ins. Tools	Each apprentice will correctly demonstrate selection and use of each tool.					
Shock First Aid Voltage/skin relationship Increasing current levels	Each apprentice will indicate correctly what to do for each of 10 situations.	2 hours	As listed in content	Presentation and pictures	Day of instruction	Situation type short-answer
<b>Current Calculations</b>						
Ohms Law						

## Self-Test Exercises

*Answer the following questions in the space provided or on separate work paper. Check your answers against the appendix in the back of the booklet.*

each step or factor in constructing a Plan For Instruction.

Construct a PFI for a portion of your related subjects instructional program.

## Answers To Self-Test Exercises

### 2. Skill: Identify Specific Knowledges, Skills, and Attitudes for Inclusion in Related Subjects Instruction

#### 1. Steps in the job analysis process:

- a. Construct activities listing chart
- b. Identify work activities as well as importance and frequency of tasks
- c. Identify equipment used
- d. Identify necessary outcomes and quality of performance
- e. Note job context circumstances
- f. Note safety requirements

#### 2. Categories of suggested content:

- a. Safety
  - Toxic substances
  - Noise
  - Protective devices
- b. Mathematics
  - Whole numbers
  - Fractions
  - Use of tables
- c. Measurement
  - Determine weight
  - Use of Tables
  - Determine angles
- d. Working in Organizations
  - Constructive criticism
  - Pride in work
  - Working under supervision
  - Time cards/paychecks
- e. Introduction of Apprenticeship
  - Provisions of apprenticeship
  - Apprenticable occupations

#### 3. The elements you must include at a minimum are:

- a. Compile and assemble outside suggestions and requirements for inclusion in content.
- b. Analyze jobs in craft or trade in which apprentices are training to develop a list of job activity and equipment used, expected quality of performance, context variables; and importance of activities.
- c. Examine activities and determine the knowledges required to engage in each activity.
- d. Group knowledges and determine which are appropriate for inclusion in related subjects instruction.

- The types of reasoning expressed in the phrases are:
- Application
  - Application
  - Application
  - Comprehension
  - Application

***Skill: Establish Standards for Successful Performance***

- a, b, c, d, e, f, g
- a
- You should have considered each of the following factors.
  - Importance and frequency of use of skill or knowledge
  - Ways used on job and how you know if it is being done correctly
  - Numbers and types of ways to tell if it is being done correctly
  - Are speed, accuracy, use of equipment and so forth important to successful performance?
  - What are minimum levels of successful performance?
  - What can be adapted and taught in related subjects?
- Ideas include her own experience; observation and discussion with other journeyworkers in the shop which she works; previous related subjects instructional experience; materials from the instructional training trust; sponsor ideas; and community college standards.

***Skill: Provide for Appropriate Use and Variety of Instructional Time, Activities and Materials***

- Steps in constructing a Plan for Instruction:
  - Construct PFI chart
  - Enter content and objectives
  - Enter length of time of instruction
  - Determine sequence
  - List expected instructional activities
  - Suggest time for evaluation
- Does your own PFI address each of the concerns listed in 1a through 1f above? Be sure that it does.

ity.

Group the following topics under the most appropriate of the suggested subject headings;

Topics: Lifting materials, solving for unknowns, calculating areas, estimating material needs, working under supervision, characteristics of materials, work rules, protective clothing, estimating job costs, reporting accidents.

Subject Headings:

Safety                      Mathematics                      Science                      Working in Organizations

Examine the following list of items to consider during a job analysis? What critical factor is missing from the list?

- activity
- frequency of occurrence of activity
- equipment/materials/supplies used
- performance outcomes
- job context concerns
- applications
- importance of activity
- \_\_\_\_\_

Recall that two types of reasoning, comprehension and application, were discussed in the text. Indicate in the space to the left of each of the following phrases the type of reasoning involved in answering the questions.

\_\_\_\_\_ Given a blueprint of a house the apprentice will estimate the number of cedar shakes required to cover the roof.

\_\_\_\_\_ The apprentice demonstrates how to use the micrometer to measure the part.

\_\_\_\_\_ The apprentice will list appropriate safety procedures for lifting heavy objects.

Circle the letter of the item that is *not* a necessary step in constructing a Plan for Instruction.

- A) Determine daily content plans
- B) Sequence topics and materials
- C) Decide on how much time and effort to devote to each subject and topic
- D) Consider when and how to evaluate each topic

\_\_\_\_\_ the following objective and answer the questions associated with it.

Each apprentice will calculate, on paper, area and perimeter values for twenty problems drawn from a working blueprint. The test will be completed in 30 minutes and must be taken within the next 6 weeks. To pass, at least 90% of the problems must be answered correctly to within 1 foot of the exact measure.

What behavior must be performed by the apprentice to demonstrate mastery?

Answer: \_\_\_\_\_

Underline the words that set forth the conditions under which performance will occur.

Please write out the standard to which the apprentice must perform in order to be successful.

C) ... during a 15 minute paper and pencil test ...

D) ... on a test that may be completed at any time during the next three months.

1. Recall that the half of a standard is called the criterion. It is the qualities of the skill being mastered. Suggest at least three qualities that could be used as criteria for the content topic of using measuring tools.

Answers:

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2. Circle the letter of the item that is the best source of information for establishing realistic criteria for success.

- A) your experience as a former apprentice and as a journeyman
- B) curriculum and content outlines for instructional materials
- C) information from other instructors
- D) journeyman activities on the job